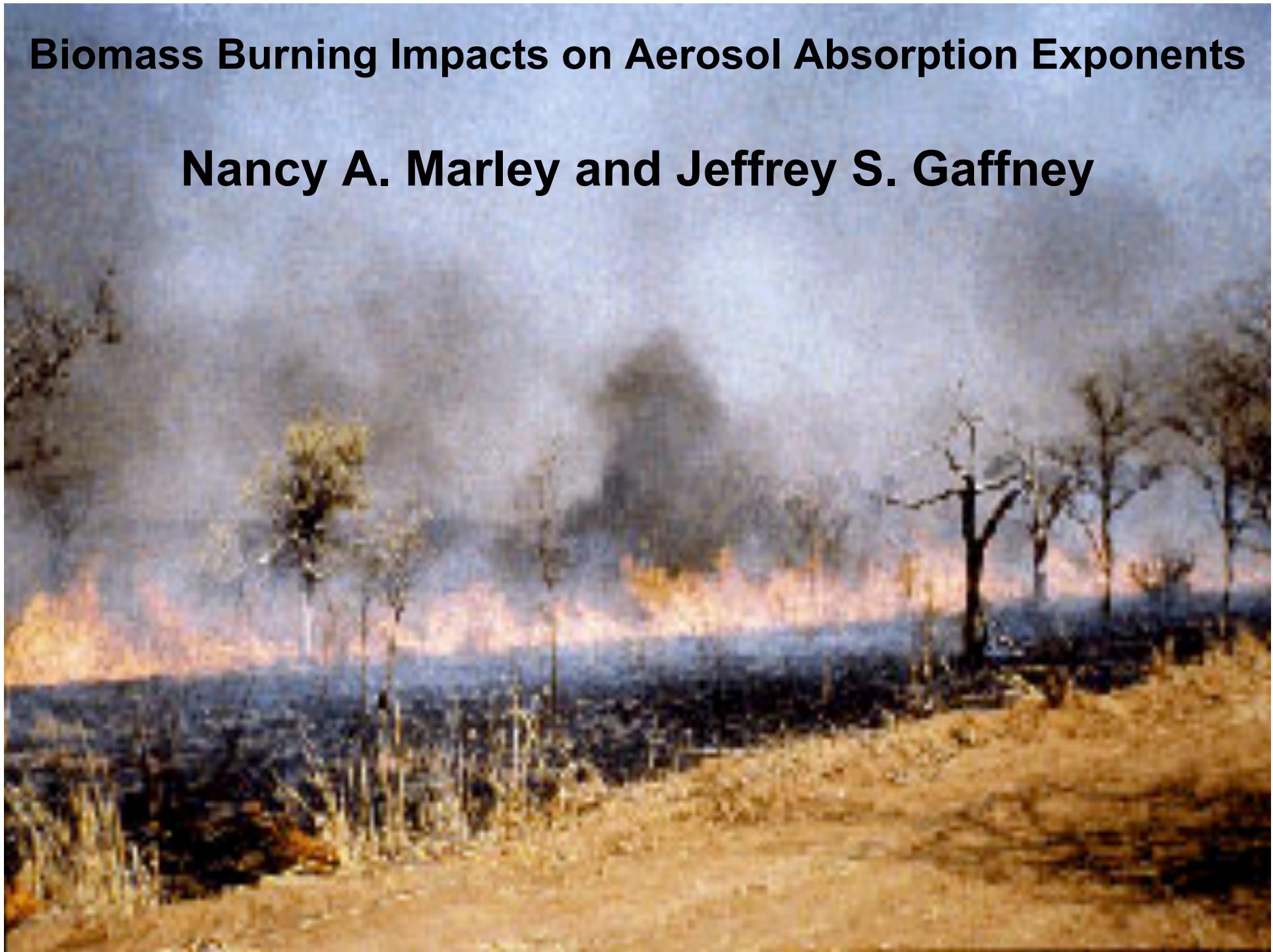


Biomass Burning Impacts on Aerosol Absorption Exponents

Nancy A. Marley and Jeffrey S. Gaffney

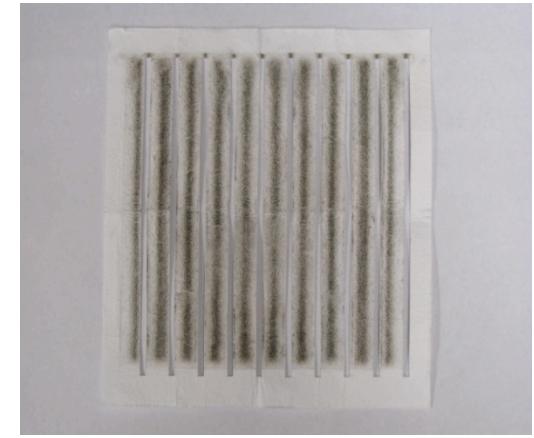
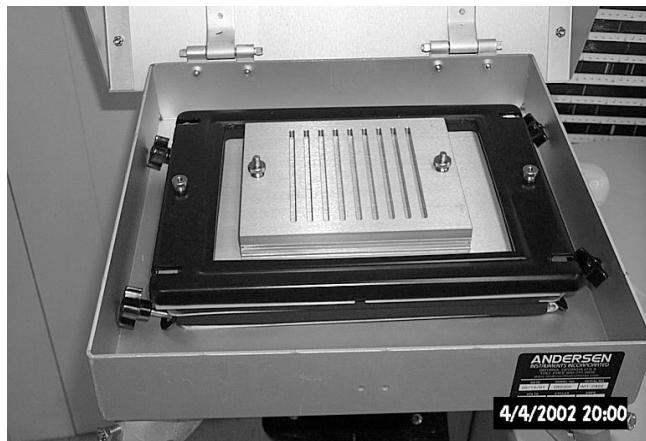


Aerosol absorption at 5 min resolution at T0. (Aethalometer, MAAP)

Fine (<1 micron) aerosols.

12 hour samples (0600 – 1800; 1800 – 0600) at both T0 and T1 on quartz fiber filters.

UV-Visible absorption profiles, FTIR, ^{14}C , ^{13}C ,



UV-Visible absorption profiles on aerosol filter samples by diffuse reflectance integration sphere spectroscopy.

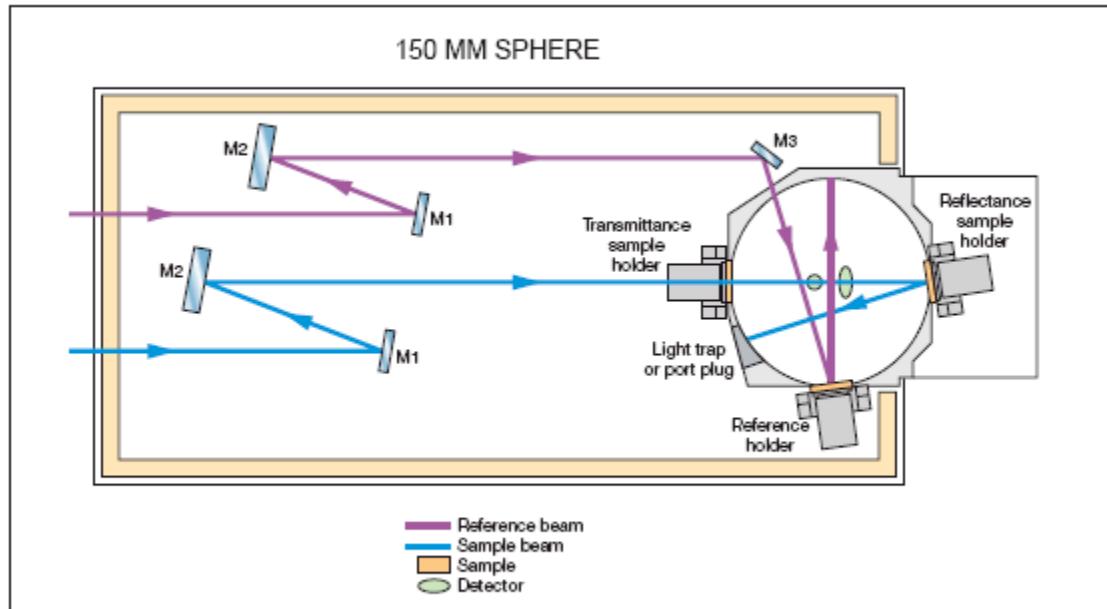


Figure 1. Optical design of 150 mm integrating sphere.

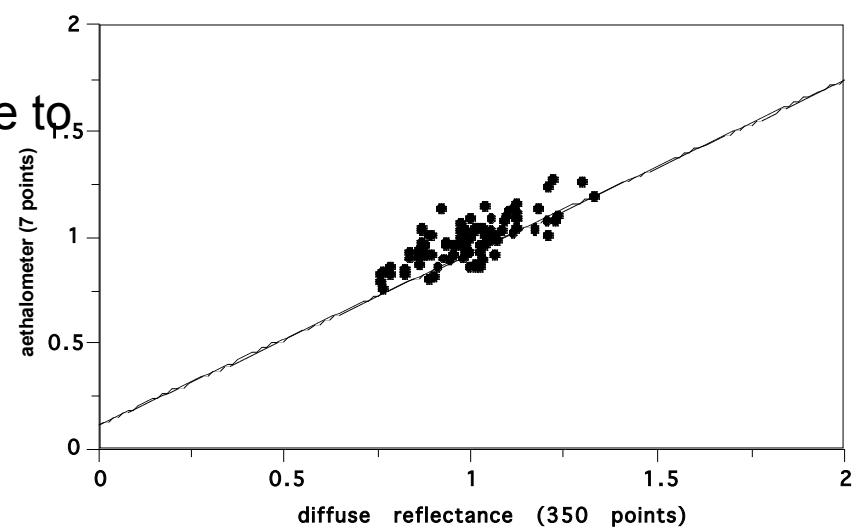
In diffuse reflectance measurements, the Kubelka-Munk function provides equivalence to absorbance in transmission spectroscopy.

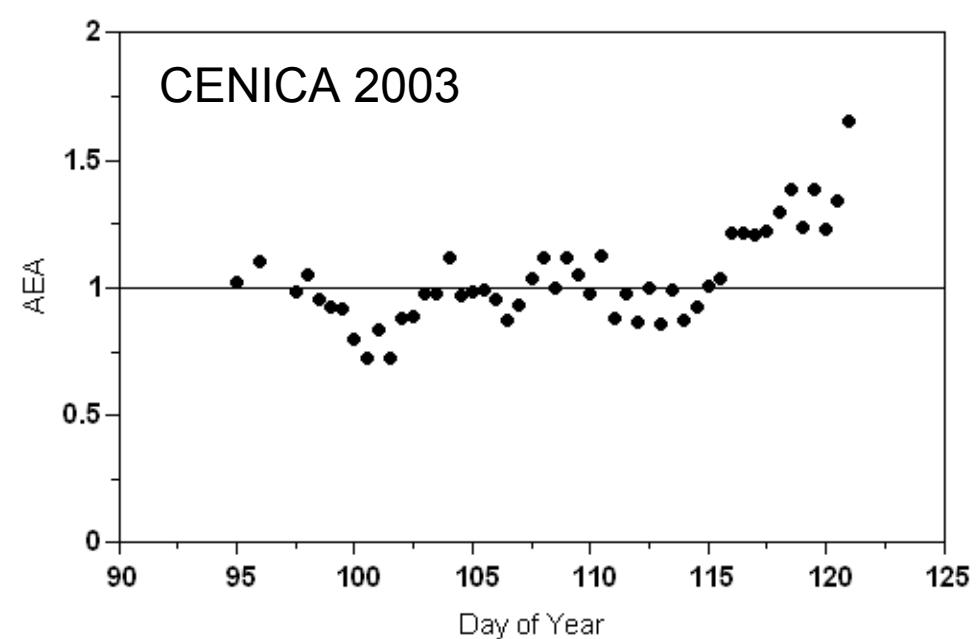
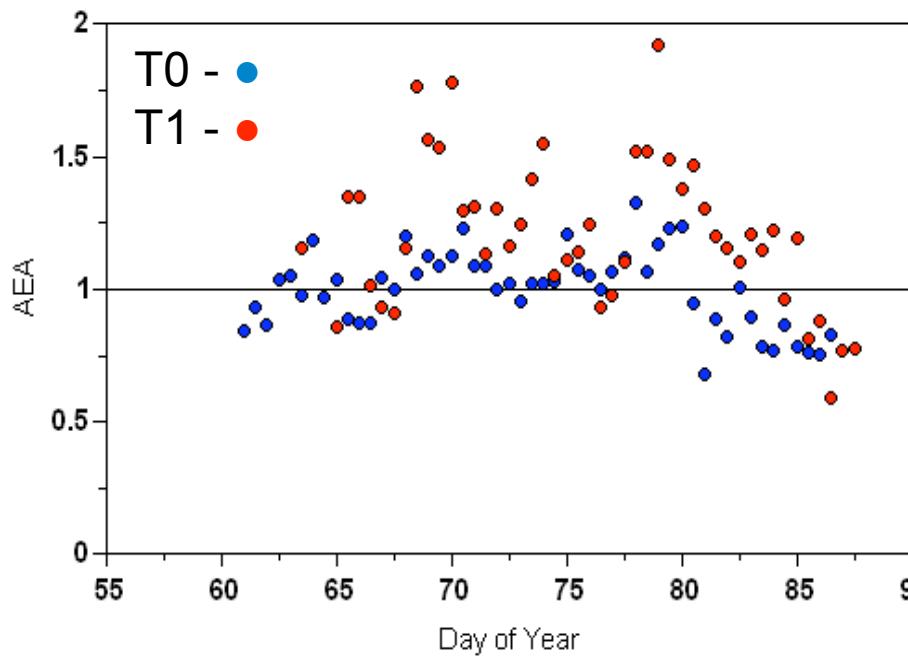
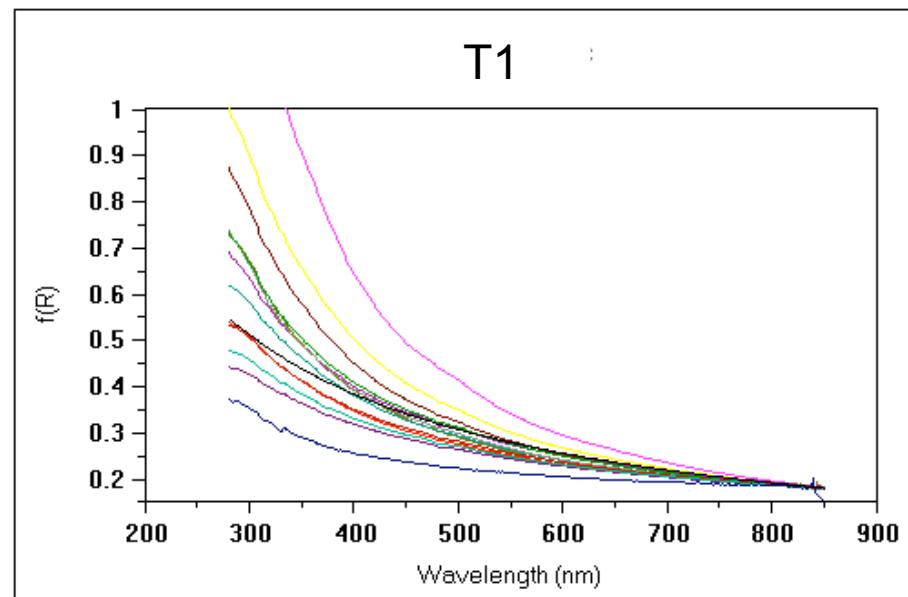
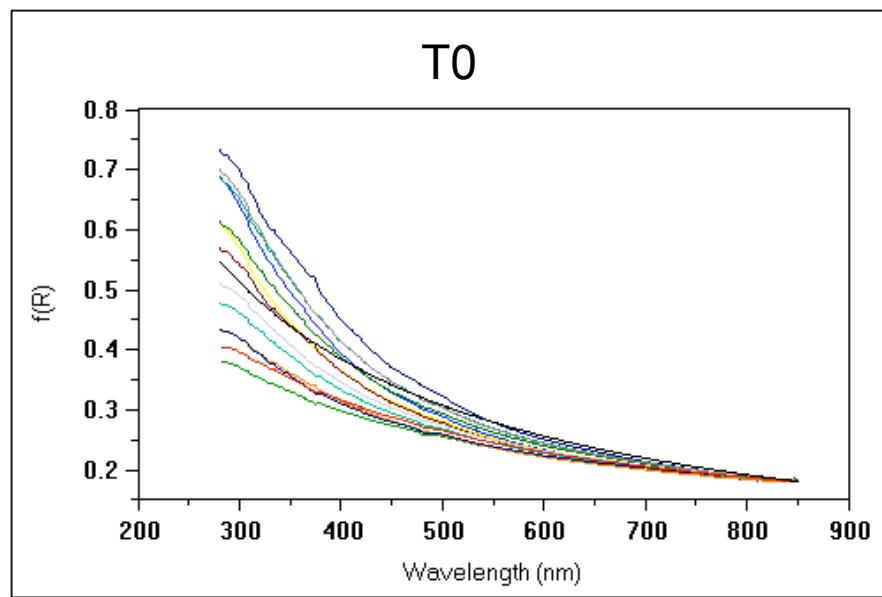
$$f(R) = \frac{k}{s} = \frac{(1-R)^2}{2R} = \frac{\epsilon c}{s}$$

Angstrom absorption exponent

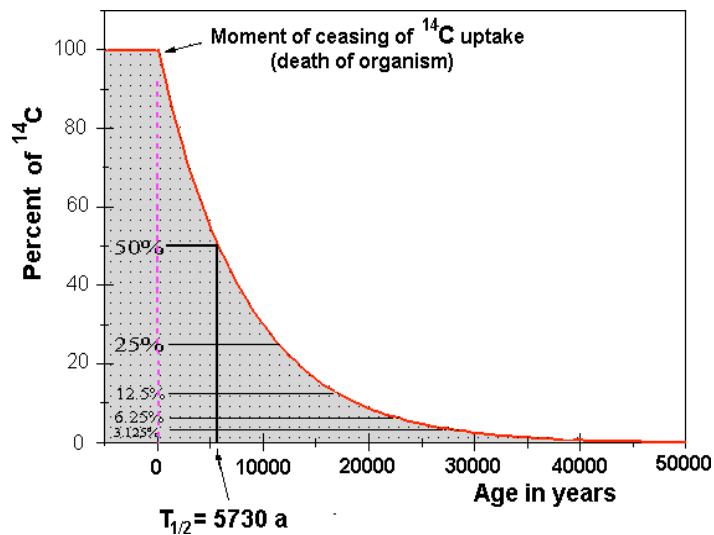
$$A = \beta \lambda^{-\alpha}$$

350 points; 300 – 880 nm



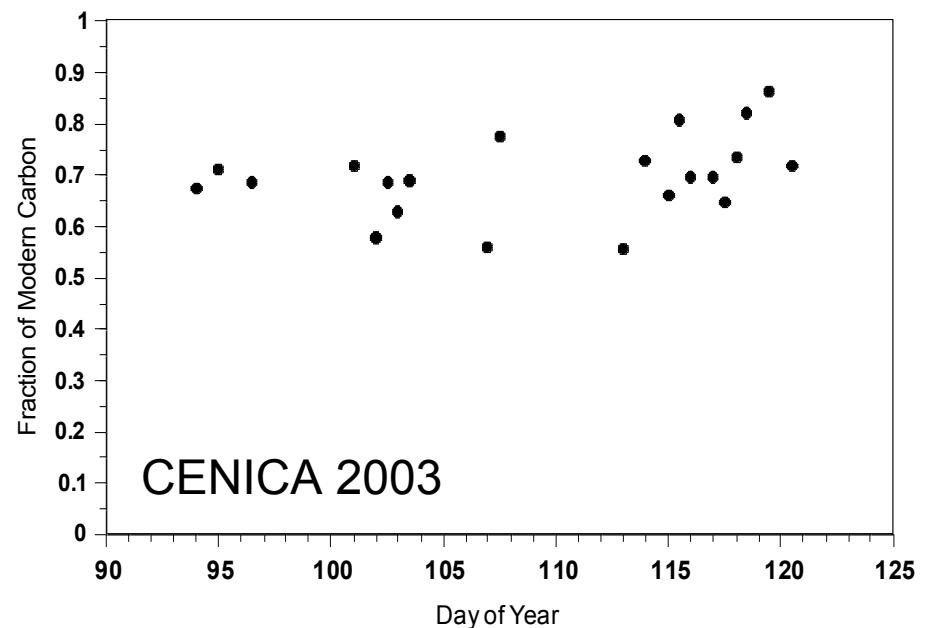
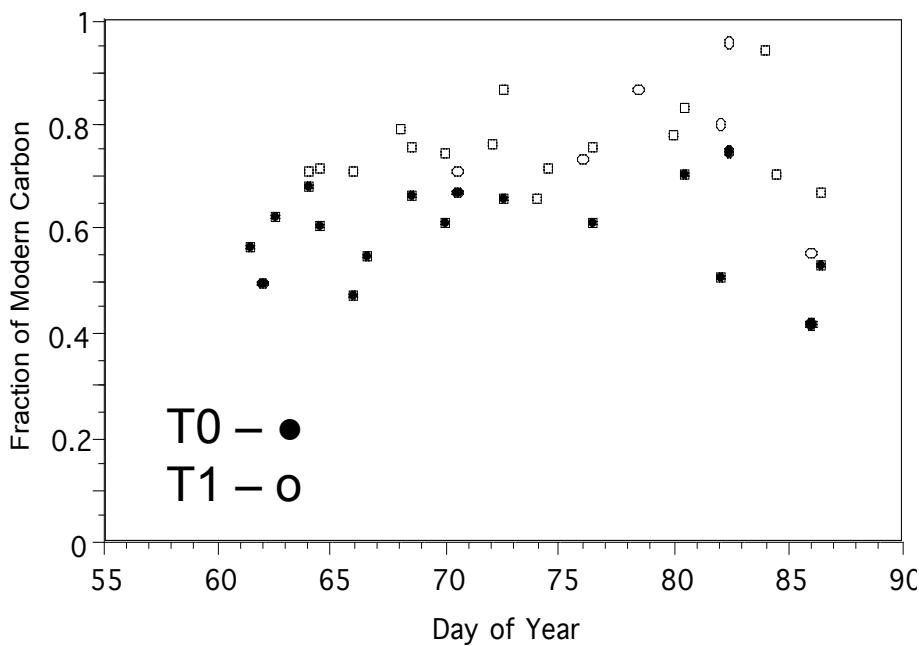


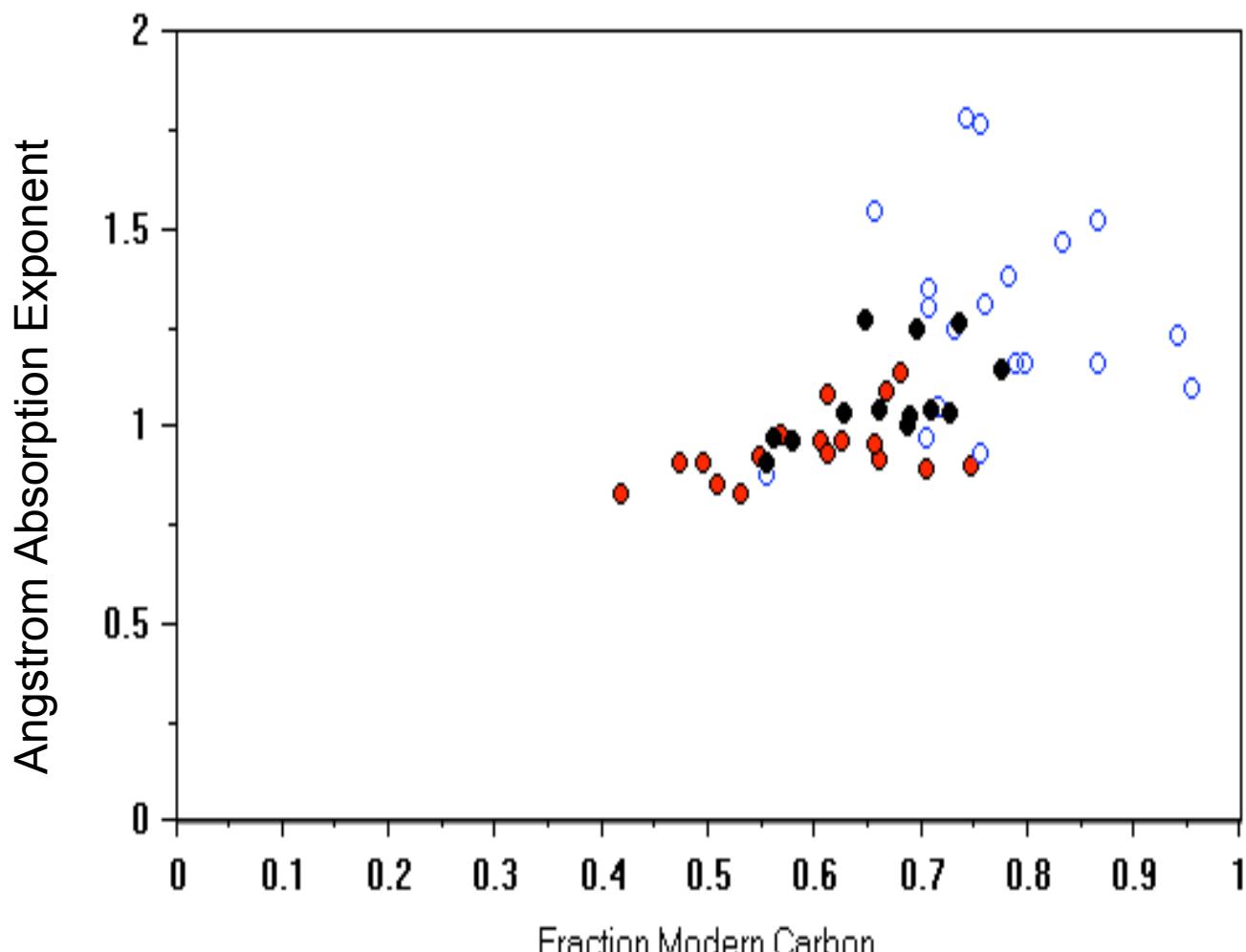
Carbon 14 – Accelerator Mass Spectrometry, (CAMS @ LLNL)



Fraction of Modern Carbon

$$fM = \frac{C_T - ^{14}\text{C}}{C_T}$$



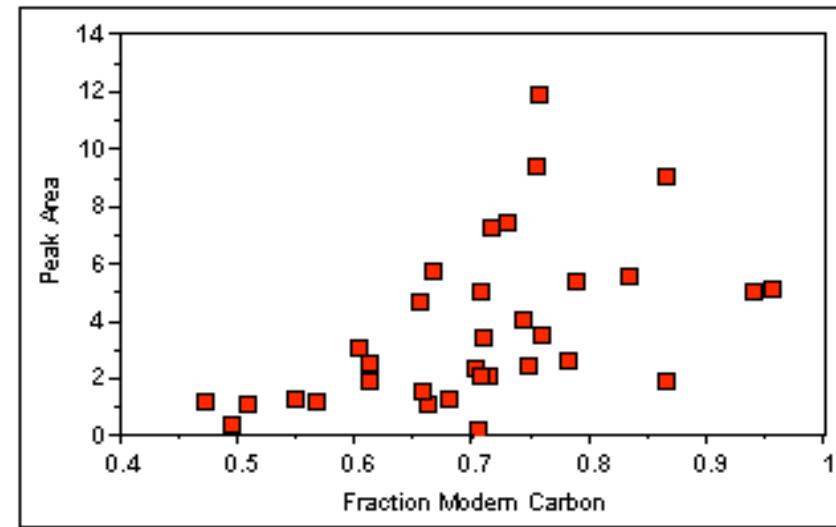
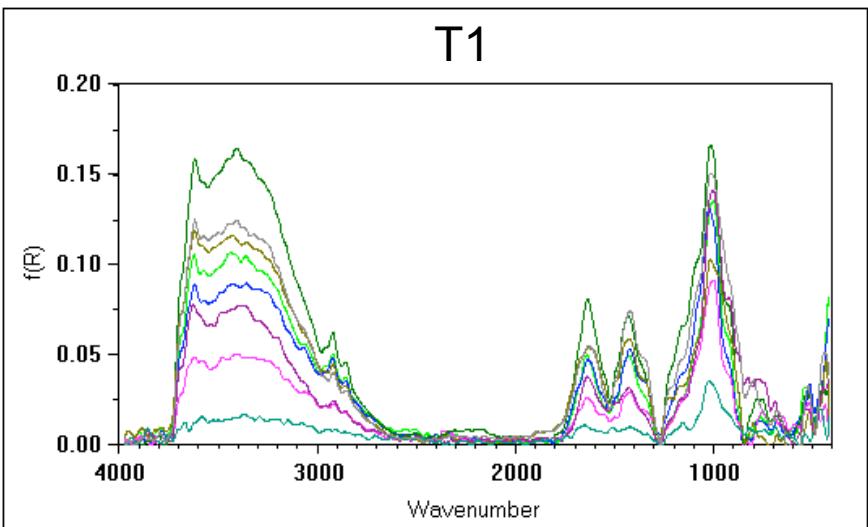
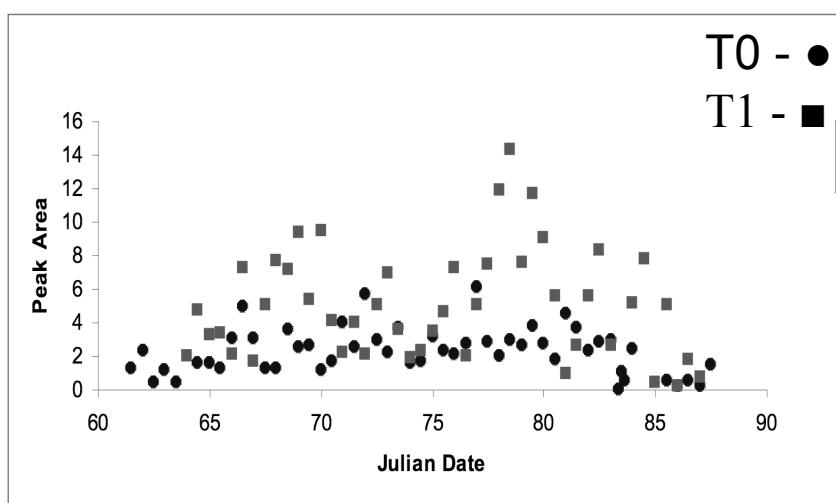
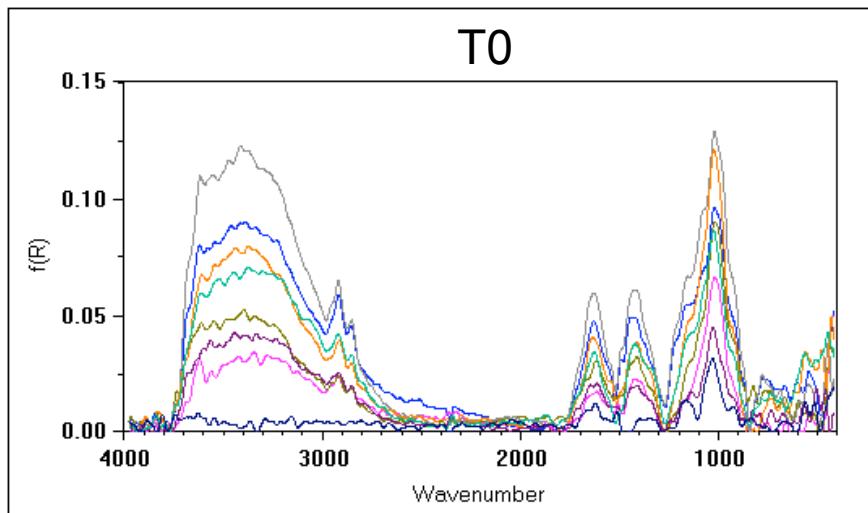


T0 - ●

T1 - ○

CENICA - ●

Diffuse reflectance FTIR of aerosol filter samples



Fraction of modern carbon (fM) reported for some urban areas.

Site	Sample	Season	Year	fM Average (Range)	Reference
Los Angeles, Ca	PM 10	S	82	0.31	Hildemann
Los Angeles, Ca	PM 10	W	82	0.41	Hildemann
Long Beach, Ca	PM 10	S	82	0.49	Hildemann
Long Beach, Ca	PM 10	W	82	0.47	Hildemann
Denver, Co	PM 2.5	S	96	0.44 (0.09-0.70)	Klinedinst
Denver, Co	PM 2.5	W	96-97	0.27 (0.13-0.72)	Klinedinst
Nashville, Tn	PM 2.5	S	99	0.69 (0.56-0.80)	Lewis
Houston, Tx	PM 2.5	S	00	0.54 (0.27-0.77)	Allen
Tampa, Fl	PM 2.5	S	02	0.75 (0.55-0.95)	Lewis and Stiles
Zurich, Ch	PM 2.5	S	02	0.63 (0.60-0.67)	Szidat
Launceston, Au	PM 10	W	03-04	0.95 (0.86-1.0)	Jordan
Seattle, Wa	PM 2.5	S	04	0.55 (0.38-0.64)	Bench
Seattle, Wa	PM 2.5	W	04-05	0.58 (0.46-0.69)	Bench
Tokyo, Jp	PM 2.1	S	04	0.38 (0.31-0.50)	Takahashi
Tokyo, Jp	PM 2.1	W	04-05	0.47 (0.41-0.54)	Takahashi
Phoenix, Az	PM 2.5	S	05	0.60 (0.49-0.75)	Bench
Phoenix, Az	PM 2.5	W	05-06	0.53 (0.49-0.59)	Bench

Gustafsson et al., Science 323, 495-498 (2009):
 Indian Ocean: Carbonaceous aerosols – 67% modern